

Bringing Oceanography into the Canadian University Classroom

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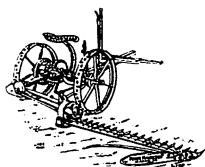
Résumé de l'article

L'Institut d'Océanographie de l'Université de Colombie Britannique, établi en 1949, inaugura l'enseignement supérieur en océanographie au Canada. Il représenta un rare exemple d'intervention du gouvernement fédéral dans la définition du contenu de l'enseignement supérieur. Face aux propositions concurrentes des universités McGill et Dalhousie, l'UCB réussit à établir cet Institut grâce aux besoins en océanographes après la seconde guerre mondiale, à la présence voisine, à Nanaimo, du Groupe océanographique du Pacifique dirigé par J.P. Tully, aux intérêts canadiens de défense pendant la guerre froide et de développement de la région arctique, et à la croissance et au succès de l'UCB pendant l'après-guerre sous son président N.A.M. MacKenzie. Afin d'obtenir des appuis pour son projet, l'UCB exploita l'intérêt manifesté envers l'océanographie physique par le Comité canadien conjoint pour l'Océanographie, constitué de hauts fonctionnaires. Par contre, l'Université Dalhousie, qui essaya de fonder un programme d'études avancées sur la bactériologie, ne put trouver d'appuis au sein du gouvernement fédéral avant l'expansion ultérieure de l'océanographie vers la fin de la décennie de 1950.

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Bringing Oceanography into the Canadian University Classroom



ERIC L. MILLS¹

RÉSUMÉ

L'Institut d'Océanographie de l'Université de Colombie Britannique, établi en 1949, inaugura l'enseignement supérieur en océanographie au Canada. Il représenta un rare exemple d'intervention du gouvernement fédéral dans la définition du contenu de l'enseignement supérieur. Face aux propositions concurrentes des universités McGill et Dalhousie, l'UCB réussit à établir cet Institut grâce aux besoins en océanographes après la seconde guerre mondiale, à la présence voisine, à Nanaimo, du Groupe océanographique du Pacifique dirigé par J.P. Tully, aux intérêts canadiens de défense pendant la guerre froide et de développement de la région arctique, et à la croissance et au succès de l'UCB pendant l'après-guerre sous son président N.A.M. MacKenzie. Afin d'obtenir des appuis pour son projet, l'UCB exploita l'intérêt manifesté envers l'océanographie physique par le Comité canadien conjoint pour l'Océanographie, constitué de hauts fonctionnaires. Par contre, l'Université Dalhousie, qui essaya de fonder un programme d'études avancées sur la bactériologie, ne put trouver d'appuis au sein du gouvernement fédéral avant l'expansion ultérieure de l'océanographie vers la fin de la décennie de 1950.

ABSTRACT

The University of British Columbia's Institute of Oceanography, established in 1949, inaugurated graduate education in oceanography in Canada. It is a rare example of federal government involvement in the content of higher education. In the face of competition from McGill and Dalhousie, UBC's success was due to the need for new personnel in oceanography after World War Two, to the presence of the Pacific Oceanographic Group under J.P. Tully nearby in Nanaimo, to Canadian interest in defence during the Cold War and in Arctic development, and to the postwar growth and success of UBC under its president, N.A.M. MacKenzie. UBC exploited the interest of the Canadian Joint Committee on Oceanography, made up of senior civil servants, in physical oceanography to get support for its endeavour. By contrast, Dalhousie, which attempted to base a graduate programme upon bacteriology, failed to find a federal government patron until oceanography expanded further in the late 1950s.

In the summer of 1949, the Vancouver *Province* reported an unusual initiative at the University of British Columbia.

The Pacific Ocean is going to come in for some close study in the near future. University of British Columbia has decided to submit plans for an Institute of Oceanography to the Varsity Senate. The plans call for close liaison with governmental departments to "develop an intensive study of the ocean."²

It is likely that oceanography signified little to the public or most politicians in 1949, and there was no precedent for its study in a Canadian university. In all of North America, only the Scripps Institution of Oceanography, formally a department of the University of California, offered graduate degrees in oceanography up to 1949. How then did UBC begin a graduate programme in a recondite and little known science?

The few examples we have suggest that pure science in Canadian universities has grown autonomously, often almost randomly, within the bounds of classical university curricula, governed by the shifting demands of the academic community, but only rarely by influences from a wider community of interest.³ Canadian university science departments have been involved in fields as varied as fisheries research, agricultural development, and chemical/bacteriological warfare, but, in terms of curriculum and long-term research directions they appear to have been influenced very little by their flirtations with outside agencies until very recent years.

The British North America Act excluded the Canadian federal government from direct involvement in education, making it a provincial responsibility. But federal influences are not rare in higher education, ranging from grants to the provinces for education to cooperative links between federal laboratories and universities. And, increasingly since 1916, when the Honorary Advisory Council on Scientific and Industrial Research (ancestor of the National Research Council of Canada) was established, the federal government has provided money for research, much of it directed, or redirected, into graduate education in the guise of support for research.⁴

What has been rare, however, is the direct involvement of any federal government agency in the establishment of a new programme of study. Oceanography proves to be an interesting example of federal involvement directly in the content of higher education, not the least because direct governmental influence

resulted in the success of a single university, UBC, in beginning Canada's first graduate programme in that subject. In 1949, McGill and Dalhousie competed with UBC for support to establish oceanography in the classroom. UBC won the toss. How this happened shows one way external influences may govern the beginning, and to a degree the content, of an academic specialty.

THE BACKGROUND OF CANADIAN OCEANOGRAPHY

Most Canadian universities, even as late as World War Two, were small, poorly funded and not research-oriented. Graduate work was poorly developed, centred mainly as pure science in the University of Toronto and at McGill.⁵ The marine sciences were represented almost entirely by marine biology, a traditional Canadian specialty, promoted by the establishment of marine laboratories on each coast in 1908 by the Biological Board of Canada (after 1937 the Fisheries Research Board of Canada). The laboratories at St. Andrews, New Brunswick, and Nanaimo, British Columbia, enabled a small but devoted board of academics, biologists with a few biochemists and physiologists, to spend summers doing research in pleasant seaside surroundings.⁶ Even when permanent staff members began to replace the summer "volunteers" from the universities after the early 1920s, the universities maintained a strong presence at the stations and on the Biological Board itself.

Physical science was virtually absent from the biological stations until the late 1920's even though Canadians had an example of sophisticated European marine science in action, including physical oceanography, in the Canadian Fisheries Expedition of 1914-1915, led for the Biological Board by the European fisheries biologist and oceanographer Johan Hjort.⁷ The brainchild of the Dominion Commissioner of Fisheries, Edward E. Prince, the Expedition was intended to discover and delimit new fishery resources (especially herring) in the Gulf of St. Lawrence. Hjort turned it into a synoptic biological and physical survey of the Gulf and the Scotian Shelf, enlisting Canadian scientists in the field work, and the help of the Swedish hydrodynamicist Johan Sandström in the analysis of the physical results. The Expedition's report (1919) became an influential text of fisheries science and ecology.⁸ But Sandström's contribution to the report, an account of the dynamical oceanography, presented as a primer of mathematical physical oceanography⁹ (much valued in later years), had practically no

effect on Canadian marine science for more than a decade, probably because it lacked an audience or professional interest group to use it; Canadian marine biologists, mathematically illiterate and caught up in other problems, paid it little attention.

Indications of an interest in physical sciences of the ocean began to appear in the late 1920s. The *Royal Commission Investigating the Fisheries of the Maritime Provinces and the Magdalen Islands, 1927-28* (the Maclean Commission), among other recommendations, suggested that the Biological Board should hire a "biological hydrographer."¹⁰ The relevant section of the report was the work of A.G. Huntsman, director of the St. Andrews laboratory and Professor of Marine Biology at the University of Toronto, whose interest in the effect of tidal exchanges in Passamaquoddy Bay required information only a physical oceanographer could provide.¹¹ H.B. Hachey, a physicist from the University of New Brunswick, who had found his way to St. Andrews in 1927, was appointed to such a position in 1928. Within a few years, as a result of his participation in the Hudson Bay Fisheries Expedition of 1930, he had learned techniques of dynamical oceanography and applied them to calculate currents in Hudson Bay.¹² But despite Hachey's position, a later investigation, the work of the International Passamaquoddy Fisheries Commission of 1931-1933, ignored physical oceanography and looked to the United States or overseas for prestigious talent in fisheries biology and other fields.¹³

The situation on the Pacific Coast was more favourable. The *raison d'être* of the Pacific Biological Station (PBS) at Nanaimo was always Pacific salmon (with a dash of other commercially important species, including herring and shellfish), but W.A. Clemens, appointed as director in 1924, recognized the need for more information on the physical environment if the highly pelagic Pacific salmon species were to be understood and well managed. Andrew H. Hutchinson, a biologist from the University of British Columbia, with the help of students and colleagues, carried out a descriptive physical and chemical oceanographic survey of the Strait of Georgia beginning in 1926, attempting to explain variations in biological production. Their work, in Clemens' words, "served to attract attention to oceanography and also helped me organize ideas."¹⁴

Failing to attract an eminent American (T.G. Thompson of the University of Washington), in 1930 Clemens recruited Neal M. Carter, a chemist, to carry out the dual tasks of surveying chemical and physical conditions in southern British Columbia waters. Because the workload was heavy, Carter was joined in 1931 by John P.

Tully, fresh from a BSc in chemistry at the University of Manitoba. Carter left PBS in 1933 to direct the Biological Board's Experimental Station in Prince Rupert, leaving Tully to handle the physics and chemistry by himself. Far from over-educated in the marine sciences, extroverted, ambitious and very energetic, Tully began to teach himself physical oceanography and to develop increasingly ambitious research projects.

PRE-WAR OCEANOGRAPHY at NANAIMO

W.A. Clemens, director of PBS from 1924 to 1940, and his successor R.E. Foerster, were united in their belief that basic research was bound to give insights of practical importance. As Foerster said in 1940:

as research progresses ... the fundamental phases become the primary concern of investigation and, in final analysis, they constitute the essential problem. They hold in so many cases the key to the explanation of the phenomena which, on the surface, are of importance in regulation and conservation.¹⁵

In this climate of opinion Tully prospered, making no distinction between purely scientific studies and those of obvious commercial importance. Temperature records had been kept at one or two locations for more than a decade and a half; Tully extended them, beginning a programme of sea temperature and meteorological observations at lighthouses along the length of the coast. These he hoped would provide information on variations in properties of the ocean on time and space scales inaccessible to the vessel-poor PBS, eventually promising correlations with the abundance of fish stocks.

Using ships of convenience, at first provided by the Canadian Hydrographic Service, then by the Navy beginning in 1936, Tully and a small group of colleagues began surveys and dynamical physical studies offshore of the West Coast of Vancouver Island and then in the Strait of Juan de Fuca. Tully taught himself dynamical oceanography using Sandström's monograph of 1919 (and other more recent publications); recognizing that he needed formal training, he enquired about work under Bjørn Helland-Hansen in Norway, eventually, for practical reasons, completing a doctorate in Seattle at the University of Washington.

When a sulphite pulpmill was proposed for Port Alberni in 1939, Tully began physical studies there to assess the effects of releasing mill wastes into the poorly-flushed waters at the head of the inlet. The field studies, and the need to make predictions about its circulation, led him to devise a hydraulic model of the inlet. This was the prototype of more ambitious models of Alberni Inlet and of Hecate Strait after the War. In the scientifically-permissive environment of PBS during the 1930's Tully, with little more than a BSc in chemistry, built a small but eclectic and broadly competent group of physical scientists of the sea, none, including himself, with any formal training in physical oceanography.

CANADIAN OCEANOGRAPHY DURING WORLD WAR TWO

In Canada, as elsewhere, submarines were responsible for bringing oceanographers into the war. Physics was brought to bear on improvements to Asdic, the early form of Sonar, used in submarine detection, as well as on problems of how to overcome the threat of magnetic and acoustic mines and acoustic torpedoes.¹⁶

Because the Royal Canadian Navy (RCN) had no research capabilities it had to find help where it could. Countermeasures against magnetic mines came first, including research on degaussing ships and the establishment of a degaussing range in Bedford Basin at Halifax in 1940. This work expanded to include a degaussing and sound range in the main channel of Halifax Harbour in 1942, and led, late in the war, to the foundation of the Naval Research Establishment on Halifax Harbour.¹⁷

Acoustic mines were first laid by German vessels in September 1940, posing a new threat to shipping. At the same time, attacks by submarines on convoys were increasing. Both made more work on underwater sound essential. The Acoustics Section of the Division of Physics and Electrical Engineering at the National Research Council (NRC) in Ottawa was asked by the British Admiralty in January 1941 to begin work on defences against acoustic mines. George S. Field of the Acoustics Section visited defence laboratories in the USA and Britain during the early months of 1941, learning all he could of countermeasures against mines and submarines and by June was assembling a team in Ottawa to work on defences against acoustic mines, in addition to early work by the group on Asdic. Late in 1941, as the importance of its work on these and other fronts grew, the NRC was appointed the Scientific Research and Development Establishment of the RCN.¹⁸

Late in 1941 the Acoustics Section's work was enlarged when the Admiralty asked U.S. and Canadian laboratories to take over the majority of antisubmarine acoustic work. After another visit by George Field to the United States, the Canadian group agreed to put its effort into the use of ultrasound in the sea. In the following year, after six bathythermographs (BT's) were brought from the U.S. to Canada, the Section began to survey the effect of hydrographic variations on the effectiveness of Asdic in detecting submarines.¹⁹ In 1943, collaborating with the RCN, Section employees and naval officers made an extensive survey of acoustic conditions using BT's off the East Coast.²⁰

During the War there were only two physical oceanographers in Canada, J.P. Tully at Nanaimo and H.B. Hachey at St. Andrews. Early in the war Hachey was in England with the Canadian Army. Tully, who had lost a leg in an accident during his childhood, remained in Nanaimo, becoming increasingly involved in the War effort. In 1943 he was "loaned" to the RCN for the duration of the war, and Hachey was brought back to St. Andrews, seconded from the Army to the RCN. Both began regular exchanges of information and collaboration with Asdic researchers in the United States. Tully, in particular, after attending conferences in San Diego in January and April 1944, warned that Asdic use could be troublesome in shallow coastal waters where temperature and depth varied greatly.²¹

The work on both coasts was integrated with that of the Acoustics Section in Ottawa in May 1944 when Tully's group was formally established as the Pacific Oceanographic Group (POG), and Hachey's as the Atlantic Oceanographic Group (AOG). Each brought the antisubmarine work of the RCN and the NRC together with Fisheries Research Board personnel and facilities, and each was under the overall direction of George Field in Ottawa, reporting directly to him. Nanaimo in particular, which was assigned the use of HMCS *Ehkoli*, an 84 foot converted seiner, for use in surveys of physical conditions, became the main center for Canadian acoustic work in the sea, especially after submarine attacks near shore practically halted activity on the East Coast early in 1945.²²

AFTER THE WAR

Physical oceanography found new tasks after the War in addition to its traditional role in providing information to fisheries biologists. The Cold War brought the threat of missile-carrying

submarines which could use their knowledge of physical conditions to play increasingly sophisticated games of electronic cat and mouse with their pursuers. The interest of the Canadian government began to turn to the Arctic, with defense, territorial protection, and resource development in mind. But virtually no information on the marine environment of the Arctic was available in 1945.

Despite the existence of AOG and POG, small groups of physical oceanographers on each coast, there were no government institutions or university departments devoted to oceanography *per se*. The Fisheries Research Board, interpreting broadly its task of promoting the fisheries through research, provided a haven for a few physical oceanographers. And the Defence Research Board, after its formation in 1947, took over the NRC's work in acoustic antisubmarine warfare, incorporated the Naval Research Establishment on the East Coast, and developed a new laboratory in British Columbia in 1948, the Pacific Naval Laboratory, devoted to defence work in the Pacific involving electronics, acoustics and physical oceanography.²³ But as the laboratories grew and their research programmes expanded there were still few oceanographers and no new sources of trained personnel.

In an attempt to make the most of oceanography's overstretched resources after the War, George Field (who had moved from NRC to DRB in 1947 as a Deputy Director General and later Chief Scientist) and a few other senior government scientists, proposed the establishment of a Canadian Joint Committee on Oceanography (JCO), whose task would be to coordinate oceanographic work on both coasts. It came into existence in April 1946, bringing together representatives of the FRB, RCN and NRC. Later the Meteorological Service, Canadian Hydrographic Service and DRB joined the JCO.²⁴ But although the JCO's members, who were senior working scientists or scientific administrators in close touch with oceanographic work, could coordinate activities, allocate ships and ship-time to projects, and redirect funds for scientific work, they could not solve the problem of scientific personnel without help.

A memo by J.P. Tully, probably written in 1948, diagnosed the problem.²⁵ Although, as Tully said, oceanography was important to fisheries, shipping, sewage disposal, ocean minerals and submarine warfare, the field had expanded too rapidly for the supply of personnel from the pure sciences to keep pace. Speaking from experience, he found that too much time was spent on training new personnel, at the expense of research. Even then, training was

largely in techniques and procedures when it should embrace familiarity with the sciences and their applications in the sea. Obviously this [the current situation] is inefficient, but it appears to be the only course unless adequate fundamental training is provided in Universities.

But even if the universities rose to the challenge, they lacked faculty members qualified to teach oceanography. Thus there was a need for newly trained staff and for oceanographic research in Canadian universities. He predicted an ample supply of jobs for graduates in oceanography, since experience at the Scripps Institution of Oceanography indicated that new jobs in the ocean sciences were appearing at least as fast as its students graduated.²⁶

FINDING A UNIVERSITY

The Executive Committee of the National Conference of Canadian Universities (NCCU), meeting in Halifax on June 13, 1949, reported as follows:

The Committee received a proposal from Dr. M.J. Dunbar of McGill University for the establishment of a Canadian School of Oceanography. The Committee recommended that there should be two schools, one at Dalhousie University and the other at the University of British Columbia. The Secretary was asked to send a resolution in support of this proposal to the appropriate authorities in Ottawa.²⁷

Rather than a beginning, the NCCU Executive Committee's resolution was the encoded outcome of more than a year of machinations by the JCO (especially George Field), President N.A.M. MacKenzie of UBC,²⁸ and J.P. Tully at Nanaimo.

According to President MacKenzie's notes, the JCO, concerned about increasing personnel in oceanography, had instigated consideration of the problem at the meeting of the Royal Society of Canada held in Vancouver in June 1948.²⁹ The President of Section V (Biological Sciences), Andrew H. Hutchinson, Professor of Biology at UBC, and the pioneer of oceanographic studies of the Strait of Georgia during the mid-1920's, seconded a resolution moved by R.D. Gibbs of McGill that:

Whereas oceanographical investigations conducted by the Fisheries Research Board of Canada over a period of thirty years were of particular

value in national defence during World War II, as well as of importance to fisheries research and

Whereas there has been formed a National Committee on Oceanography under the joint auspices of the National Research Council, the Royal Canadian Navy and the Fisheries Research Board for the carrying out of oceanographic investigations applicable to defence and fisheries problems and

Whereas there is an urgent need for the training of young men for participation in the investigational programmes being developed and for the conduct of fundamental research

Be it resolved that the Royal Society of Canada recommend that there be established in Canada an Institute of Oceanography, and that copies of this resolution be sent to the Department of National Defence, to the National Research Council, to the Royal Canadian Navy, to the Fisheries Research Board and to the Universities of Canada.³⁰

Then, according to the records of Section V's meeting, "following the presentation of the report. ... Dr. A.G. Huntsman stressed the importance of the establishment of an Institute of Oceanography in Canada, and suggested that the recommendations put forth by Section V be carried out at once."

Events were in motion well outside the sanctum of the Royal Society. Sometime in 1948, George Field, newly-established on the Ottawa headquarters staff of the Defence Research Board, visited President MacKenzie of UBC in Vancouver to suggest that UBC start "instruction and fundamental research in oceanography", promising that DRB would provide "substantial assistance" toward the beginnings of an Institute of Oceanography.³¹ By August 1948 an institute at UBC was being discussed by George Field and J.P. Tully as a certainty. Field suggested that UBC attempt to recruit the eminent British tidal expert Joseph Proudman as lead of the UBC group and said that DRB would seriously consider supporting the research of the UBC physicist George L. Pickard since he was showing signs of interest in oceanography.³²

Early in 1949, President MacKenzie met with George Field, H.B. Hachey, W.A. Clemens (former director of PBS and now Head of the UBC Zoology Department), J.S. Johnson (Director of Scientific Services, RCN) and Gordon Shrum (Head of the UBC Physics Department) to consider the location of an institute of oceanography, which clearly had to be at UBC or at Dalhousie. They agreed to support UBC first because of its location and facilities and because

of the background of work at PBS. Dalhousie could come later.³³ Then, at this or another meeting, Field, on behalf of the DRB agreed to provide salary for one position in the new institute, to pay for sending G.L. Pickard to the Scripps Institution of Oceanography for a year's training in oceanography, and to make available as a teacher W.M. Cameron, a DRB employee who had worked with Tully in Nanaimo, for the 1949-50 academic year. By agreement of the JCO, Tully would also be freed to teach in Vancouver when the new institute opened.

Thus, by the time that McGill's M.J. Dunbar had made (in MacKenzie's words) "a strong case for" oceanography at McGill, and at the time of the NCCU's anodyne resolution, UBC had already been selected and was on its way. On August 26, 1949 the UBC Senate approved President MacKenzie's proposal for an Institute of Oceanography; three days later the Board of Governors approved the new Institute and granted it \$350 for 1949/1950. Students were waiting in the wings. Within days the institute of Oceanography at UBC (IOUBC) was in action, with agreement that "premature definition of objectives was not desirable."³⁴ With enviable freedom and support, IOUBC began a ten-year period alone in educating Canadian oceanographers.

WHY NOT DALHOUSIE?

UBC had out-maneuvered the opposition in 1948/1949, but it had not eliminated it entirely. At Dalhousie University, its President Alexander E. Kerr and F. Ronald Hayes, a long-time faculty member, soon to be promoted to Professor of Zoology,³⁵ began a campaign for a programme in oceanography at the university. Recognized by the JCO and the NCCU as a promising site for an institute on the East Coast, Dalhousie attempted to capitalize on its location, on its importance during the war years, on Hayes's reputation, and on the need for new personnel in his specialty at that time, aquatic microbiology (referred to then as "bacteriology").

Hayes, who had a strong interest in physiological aspects of biology and who was attempting to apply physiology and biochemistry to ecological systems, had begun to study the roles of bacteria in nutrient cycles. He tried to build a case for oceanographic studies at Dalhousie that would be centred on bacteria, making the point that Dalhousie could "provide research and the training of students in general bacteriology and cognate fields, with the object of producing men who can fill scientific posts in

the Canadian fisheries and food processing industries, universities, and government services, as well as contributing to the solution of some urgent marine problems."³⁶ Canada lagged behind other countries in marine bacteriology; Woods Hole Oceanographic Institution alone had "several" bacteriologists, while Canada had a shortage. Marine bacteriology at Dalhousie would alleviate the shortage, and would enhance marine biology in Canada, a field that had been selected for special attention by the NCCU. Hayes worked out a programme of study involving undergraduate courses and what he called "more advanced training and opportunity for graduate research." The latter would require personnel – he suggested a professor, assistant professor and a clerical worker, in addition to laboratories and equipment. The initial cost would be \$25,000, thereafter for a time \$19,000 annually to establish the programme.

Hayes and Kerr had begun to campaign in Ottawa for Dalhousie's project no later than August 1949, starting with the local MP, Gordon Isnor, then approaching J. Watson MacNaught, Parliamentary Assistant to the Minister of Fisheries. In November 1949, Kerr submitted Hayes's proposal to R.W. Mayhew, Minister of Fisheries (and a British Columbia MP, from Victoria). Mayhew's reply of November 30, 1949, reiterated by his Deputy Minister, Stewart Bates, a week later, is revealing. His letter said, in part:

... we cannot altogether reconcile the stress you place on the specific field of bacteriology, since the present demands on oceanography are for work in the physical phase together with more emphasis on the broad biological sector. This latter, in our opinion, should include a study of all animals in relation to their environment – more a matter of marine ecology.

Bacteriology would undoubtedly be a part but a much smaller one than you have appeared to outline.

Mayhew then went on to offer Hayes advice about how to proceed, noting that UBC had linked itself to the JCO.

It may be that some similar arrangement could be made by Dalhousie University. If this develops, it would seem advisable to have Dalhousie submit a programme to the Joint Committee on Oceanography which would review the plans and recommend to the Departments represented on the Committee what action should be taken in the light of the urgent need for

the expansion of oceanographic studies on the Atlantic Coast.

You may be assured that this Department will give the most careful consideration to any such recommendations.³⁷

This was not quite a brushoff, but an unmistakable message that Hayes and Kerr were barking up the wrong tree. The power and ability to promote initiatives lay with the JCO, which Hayes had not attempted to court. Although Hayes and Kerr continued to lobby in Ottawa until early in 1951, they eventually gave up until a new climate of support for the ocean sciences began to develop at the end of the decade.³⁸

Hayes had made a strategic error by emphasizing marine biology, especially bacteriology, at a time when the JCO, under Field's direction, was interested in developing physical oceanography. But other factors were influential too. In 1949, Dalhousie was a small, financially-struggling university of 1700 students and a faculty of about 120, only 48 in the Faculty of Arts and Science. There were a few tens of students in MSc programmes, but Dalhousie's first PhD programme (in Biology, beginning in 1955) was several years away. The contrast of Dalhousie with UBC is striking. At UBC the student body had risen from 3000 in 1944/45 to more than 9000 in 1947/1948.³⁹ In 1945/1946 alone, the University had received \$5 million from the Provincial government for a building programme; twenty permanent buildings went up between 1945 and 1951. New facilities were established, 110 new courses were offered in 1947/1948, and the faculty rose to more than 800. An appeal for \$1 million for research was launched in 1946 and PhD programmes were approved in 1948. In all this, including the establishment of the Institute of Oceanography, President MacKenzie was not passive. According to P.B. Waite:

He believed in [UBC's] destiny and he was not a person who believed in sitting back while destiny rolled its slow course along. He preferred to get behind it and give it an almighty shove.⁴⁰

Under these circumstances alone, UBC was bound to be favoured. When Hayes designed a programme for Dalhousie that ignored the wishes of the JCO, to concentrate on a field unknown in Canada, marine bacteriology, he was doubly bound to fail, as he and Kerr recognized after nearly three years of fruitless efforts along the wrong channels in Ottawa.

POINT GREY BEFORE HALIFAX

UBC's success in beginning Canada's first educational programme in oceanography was the result of the need for new personnel in a field that had proved important in time of war and would certainly be important during a troubled peace. The role of the federal government was critical in providing the fuel for takeoff – that is, money and the first teachers. But other factors entered into UBC's prevailing in competition with Dalhousie and McGill. UBC, for example, had the advantage of fast and expert footwork by its President, N.A.M. MacKenzie, an aggressive, experienced institution builder. Although MacKenzie claimed that UBC could not afford to go it alone,⁴¹ financial considerations did not prevent him from being actively receptive to the new institute being set up at UBC when that was proposed by G.S. Field.⁴²

What Robert Merton calls "the Matthew effect"⁴³ also played an important part in UBC's success. By 1949 UBC was a wonder of the Canadian educational world, experiencing a period of near exponential growth in which a major university emerged from the forest and mud of Point Grey. UBC was on its way into the Canadian academic firmament. Those that have frequently do get even more. UBC's size, expansionism and financial prospects made it the logical place for an important initiative in Canadian graduate education.

Location also counted for a great deal. PBS in Nanaimo was only a short ferry ride from Vancouver and when DRB's new laboratory, the PNL, opened in 1948, it too was only a short distance away and could contribute to, or benefit from, the new institute. Relations were close in those early years. When W.M. Cameron, a junior colleague of Tully at PBS, was considering teaching in the new Institute, he had the chance of a position at PNL with DRB or in UBC. Gordon Shrum of UBC advised Cameron that there was no practical difference between the two. Cameron chose DRB and began his teaching in IOUBC from that vantage point.⁴⁴

Dalhousie University, in its more isolated position on the East Coast, was separated by distance and by attitudes from the Atlantic Biological Station at St. Andrews, but even more from the most important patrons of Canadian marine science, branches of the federal government acting through the Joint Committee on Oceanography. UBC readily found its constituency in the JCO. The NRC and the POG in Nanaimo had collaborated closely in work on physical oceanography during the War. When peace came, but with it Cold War threats, naturally the newly established DRB

looked to Nanaimo, and to the closest university that could meet its needs for expertly educated specialists in physical sciences of the sea. UBC was there; it was ready, willing and could be made able. F.R. Hayes's proposal to base graduate training in oceanography at Dalhousie upon bacteriology, while it might be meritorious, was no match for the community of interest that linked UBC, the POG and the JCO.

Then too, there were matters of chance. Without the vigour and optimism of J.P. Tully, promoting physical oceanography in an apparent backwater, Nanaimo between the wars, there would have been no rapid expansion of antisubmarine research in the quiet, safe coastal waters of British Columbia – and no base to build upon when an academic institution was needed. Tully's early work took place in the liberal intellectual climate provided by W.A. Clemens (who later could promote oceanography from his position in UBC), and then under R.E. Foerster, the PBS director during the war years. Tully's entrepreneurial spirit and his extroverted boosting of everything oceanographic – including his willingness to teach for part of each week at UBC – contributed to the origin and the early success of IOUBC.

No single cause can be isolated to account for the origin of academic oceanography in Canada on Point Grey rather than in Halifax. For UBC the circumstances and the time were right. But without the boost provided by a federal government agency, the Defence Research Board, through the Joint Committee on Oceanography, it is unlikely that UBC would have acted alone. Given the stimulus of financial support and teaching assistance, UBC was prepared to act with despatch. It did so, providing an interesting – though perhaps isolated – example of how new academic specialties may become established. Micro-dissection of other cases from Canadian universities may give us more examples of how academic and public affairs come to live together. Oceanography is unlikely to be the only case of a discipline that entered the ivy-covered halls from outside the imbricated, inturned concerns of everyday university affairs.

NOTES

- 1 Dept. of Oceanography, Dalhousie University, Halifax, Nova Scotia B3H 4J1 "This research was supported by a grant from the Social Sciences and Humanities Research Council of Canada."
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- 2 Vancouver Province, undated, probably July 1949: clipping in POG Scrapbook, Library, Pacific Biological Station, Nanaimo, B.C.
- 3 See, for example, B.N. Smallman, H.M. Good and A.S. West, *Queen's Biology. An academic history of innocence lost and fame gained* (Kingston, Ontario, 1991). Yves Gingras, *Physics and the rise of scientific research in Canada* (Montreal and Kingston, 1991), shows the close link of the physics curriculum with the needs of engineering, but that this did not restrain the development of a strong, internally-directed research orientation in Canadian physics departments. Even the close link of Canadian chemists and microbiologists with defence research during World War Two (John Bryden, *Deadly allies: Canada's secret war 1937-1947* (Toronto, 1989)) was only a brief redirection from mainly academically-oriented research.
- 4 Robin S. Harris, *A history of higher education in Canada 1663-1960* (Toronto, 1976), 323; Y. Gingras, *Physics and the rise of scientific research*, 53-66.
- 5 R. Harris, *History of higher education*, Ch.17; Y. Gingras, *Physics and the rise of scientific research*, Ch.3.
- 6 On the background and development of the marine stations, see Kenneth Johnstone, *The aquatic explorers. A history of the Fisheries Research Board of Canada* (Toronto, 1977), Ch's 6, 9, and Jennifer Hubbard, *An independent progress: the development of marine biology on the Atlantic coast of Canada 1898-1939* (Ph.D thesis, University of Toronto, 1993).
- 7 Jennifer Hubbard, *An independent progress*, Ch.III.
- 8 Department of the Naval Service, *Canadian Fisheries Expedition, 1914-1915. Investigations in the Gulf of St. Lawrence and Atlantic waters of Canada* (Ottawa, 1919).
- 9 Johan Sandström, "The hydrodynamics of Canadian Atlantic waters", in *Canadian Fisheries Expedition 1914-1915*, pp.221-346.
- 10 Jennifer Hubbard, *An independent progress*, 397.
- 11 Jennifer Hubbard, personal communication.
- 12 H.B. Hachey, "Report on the Hudson Bay Fisheries Expedition of 1930.A. Open water investigations with the S.S. Loubyrne," *Contributions to Canadian Biology and Fisheries*, N.S., 6(23) (1931), 465-471; H.B. Hachey, "The general hydrography and hydrodynamics of the waters of the Hudson Bay region," *Contribution to Canadian Biology and Fisheries, Series D*, 7 (1931), 91-118. The Expedition, intended to search for commercial fisheries resources in Hudson Bay, drew a blank: except near

shore there were few fish of any kind and no prospect of any sustained fishery.

- 13 Jennifer Hubbard, *An independent progress*, 329-343, 386-388.
- 14 W.A. Clemens, "Education and fish. An autobiography," *Fisheries Research Board of Canada, Manuscript Report Series*, No. 974 (1968), 50. On the development of physical oceanography at PBS, see Eric L. Mills, "Pacific waters and the POG. The origin of physical oceanography on the West Coast of Canada." In, *Oceanographic history: the Pacific and beyond* (ed. K.R. Benson) (Seattle, in press).
- 15 R.E. Foerster, in *Fisheries Research Board of Canada. Report of the Pacific Biological Station for 1940* (1940), 1.
- 16 On the Canadian situation see especially Marc Milner, *North Atlantic Run: the Royal Canadian Navy and the battle for the convoys* (Toronto, 1985); Marc Milner, "Inshore ASW: the Canadian experience in home waters," in A.B. Douglas (ed.) *The RCN in transition 1910-1985* (Vancouver, 1988); and David Zimmerman, *The Great Naval Battle of Ottawa* (Toronto, 1989). A useful outline of the NRC's role is given by W.E.K. Middleton, *Physics at the National Research Council of Canada, 1929-1952* (Waterloo, 1979) esp. Ch 7 (i). A brief account of naval research during the War is D.J. Goodspeed, *A history of the Defence Research Board of Canada* (Ottawa, 1958), 207-211.
- 17 Goodspeed, *Defence Research Board*, 207-209, 211; Zimmerman, *Great Naval battle*, 96.
- 18 Middleton, *Physics at NRC*, 87-88, 92-93; Zimmerman, *Great Naval Battle*, 94-95; Goodspeed, *Defence Research Board*, 210-211. The NRC's formal link with the RCN lasted until 1943 when the RCN's Research Division was established.
- 19 Underwater sound is greatly affected by variations in temperature and salinity, especially the region of sharp temperature change below the surface called the thermocline. The BT was developed by Athelstan Spilhaus, before the war, to enable rapid measurement of vertical temperature change; see A.F. Spilhaus, "A bathythermograph," *Journal of Marine Research*, 1(1938), 95-100; A.F. Spilhaus and A.R. Miller, "The sea sampler," *Journal of Marine Research*, 7(1948), 370-385. The U.S. Navy rapidly began use of BTs to increase the effectiveness of their antisubmarine work.
- 20 Milner, "Inshore ASW," 150; Zimmerman, *Great naval battle*, 132-133.
- 21 Milner, "Inshore ASW," 153, 372.
- 22 Zimmerman, *Great Naval Battle*, 132-133; Middleton, *Physics at the NRC*, 91. In early documents the new groups were referred to as Atlantic and Pacific Oceanographic Research Groups (AORG and PORG). These names were soon shortened. Both AOG and POG long outlasted the war, surviving until the 1970's (on POG's later work see Mills, "Pacific waters and the POG").
- 23 Goodspeed, *Defence Research Board*, 211-216. The FRB formally extended its work to the Arctic beginning in 1949 – see M.J. Dunbar, "Eastern Arctic waters," *Fisheries Research Board of Canada, Bulletin* No. 88 (1951), 19-20 and M.J. Dunbar, "The history of oceanographic

- research in the waters of the Canadian Arctic islands," in M. Zaslow (ed.) *A century of Canada's Arctic islands* (Ottawa, 1981), 146. Combined U.S.-Canadian naval operations taking place in the Arctic between 1946 and the mid 1950's made at least token and sometimes significant contributions to Arctic oceanography.
- 24 H.B. Hachey, "History of the Fisheries Research Board of Canada," *Fisheries Research Board of Canada, Manuscript Report Series (Biological)* No. 843 (1965), 295-301; see also H.B. Hachey, "Facilities for studying the oceans," *Proceedings of the Royal Society of Canada, Series III*, 43(1949), 187-191.
 - 25 J.P. Tully, "Oceanography in relation to university training," undated typescript. Dalhousie University Archives. President's Office. Institute of Oceanography 1948-1959, MS1-3, A678. There is no indication who was intended to read Tully's memo; it was probably prepared for the JCO.
 - 26 The Scripps Institution of Oceanography expanded dramatically after the War, capitalizing at first on the scientists who had found their way into oceanographic research during the War but who lacked formal qualifications in the field – see E.N. Shor, *Scripps Institution of Oceanography: probing the oceans 1936 to 1976* (San Diego, 1978) Ch.2.
 - 27 Report of *National Conference of Canadian Universities, Twenty-fifth meeting held at Dalhousie University, June 13th-15th, 1949*, 80.
 - 28 At the 1949 NCCU meeting, its Executive Committee included as President F. Cyril James (Principal of McGill University) and as Retiring President N.A.M. MacKenzie (President of UBC).
 - 29 N.A.M. MacKenzie, memo "Institute of Oceanography", accompanying letter to Registrar of UBC, 29 July 1949. Archives, University of British Columbia. Senate documents. *OCEANOGRAPHY* – Institute of. 31-4 SENATE. Letters. 4. *From the Board of Governors*. (a) Approval of recommendations of Senate. (1) Re. Institute of Oceanography.
 - 30 *Proceedings and Transactions of the Royal Society of Canada*, Third Series, Volume XL11 (1948), 57.
 - 31 University of British Columbia Archives, President's Office General Correspondence, Microfilm roll 122. Minutes of Committee on Oceanography, 6 October 1949, Appendix A. Note by W.A. Clemens on background of Institute of Oceanography, UBC.
 - 32 Scientific Archives, Pacific Biological Station, Nanaimo, B.C., File No. B2/1/7/. 1-4-1. *Correspondence to and from Dr. F.H. Sanders*. George S. Field to J.P. Tully, 20 September 1948.
 - 33 UBC Archives, President's Office, General Correspondence, Microfilm roll 122. Minutes of Committee on Oceanography, 6 October 1949. At this meeting President MacKenzie outlined events leading to the founding of UBC's Institute of Oceanography.
 - 34 UBC Archives, N.A.M. MacKenzie memo, 29 July 1949, and President's Office, General Correspondence, Microfilm roll 122 (see Notes 29, 33)
 - 35 Hayes, a Nova Scotian, received a Ph.D at Liverpool and did postdoctoral work in Plymouth and Kiel before returning to Dalhousie University in 1930 as an Associate Professor. He was promoted to Professor in

- 1949 during the tenure of A.E. Kerr as President (1945-1963) and was highly respected by Kerr, who went to considerable lengths to promote Hayes's proposal for an institute of oceanography at Dalhousie.
- 36 Dalhousie University Archives. President's Office. Institute of Oceanography 1948-1959. MS-1-3. A678 "Memorandum on the Establishment of Teaching and Research in Oceanography at Dalhousie University, Halifax," by F.R. Hayes, 24 October, 1949.
 - 37 Dalhousie University Archives, President's Correspondence. Institute of Oceanography 1948-1959. R.W. Mayhew to A.E. Kerr, 30 November 1949.
 - 38 Dalhousie's Institute of Oceanography, directed by Hayes, was established in 1959 under NRC support which was distributed evenly between the fledgling at Dalhousie and the veteran Institute at UBC.
 - 39 On the growth of UBC, see especially H.J. Logan, *Tuum est. A history of the University of British Columbia* (Vancouver, 1958), Ch.7 and P.B. Waite, *Lord of Point Grey. Larry MacKenzie of UBC* (Vancouver, 1987), Ch's 8-10.
 - 40 P.B. Waite, *Lord of Point Grey*, 119.
 - 41 W.A. Clemens, "Education and fish," 66.
 - 42 It appears that Field even suggested the name – see Clemens, "Education and fish," 66.
 - 43 Robert Merton, "The Matthew effect in science," *Science* 159(3810) (1968), 56-63.
 - 44 W.M. Cameron, interview in West Vancouver, B.C., 11 November 1991. This step was crucial. As a federal government employee Cameron later played a major role in the expansion of government oceanography, including the founding of the Bedford Institute of Oceanography in 1962.

BIOGRAPHICAL NOTE

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